REMARKS

The Official Action of August 6, 2003, and the prior art relied upon therein have been carefully reviewed. The claims in the application are now claims 1-37, and these claims define patentable subject matter warranting their allowance. Accordingly, the applicants hereby respectfully request favorable reconsideration of the rejected claims, and allowance of this application.

Claims 17-27 and 32 have been only objected to, i.e. these have not been rejected on any basis including prior art. Applicants accordingly understand that these claims are deemed by the PTO to define novel and unobvious subject matter under §§102 and 103. Claim 17 has now been rewritten in independent form as new claim 37, which should be allowable.

According to the currently submitted amendment, the present invention is directed to:

a) a method for handling optical pulses in telecommunication fiber links by selecting the inner optical path in one or more SHG elements, to secure a required treatment of the incoming optical pulse (Claim 1 as amended).

b) a device for handling an optical pulse signal in a fiber communication link, comprising one or more SHG

elements and adapted for selectively adjusting the inner optical path via said element(s) (see new claim 35);

c) a device for handling optical pulse signals in telecommunication fiber-optic networks, enabling selection of a proper inner optical path for achieving the objectives of the invention. (Claim 13 is amended, now dependent on the new Claim 35).

d) a method for providing the device suitable for selectively adjusting its inner optical path (Claim 29 as amended).

Dependent claims in the present amendment are directed to:

d) Exact criteria for obtaining correct lengths of the inner paths for various purposes (method Claims 2, 3, 4, apparatus claims 14,18,19, 33, 34)

e) Specific structure of the SHG element to ensure adjustment of the inner optical path (among the claims considered acceptable by the Examiner, claim 17 is amended and now depends on the new Claim 35).

f) Specific principles for providing new SHG modules (Claims 30,31).

g) Specific features of the device (a new apparatus claim 36, parallel to the method claim 31).

Claims 1-16, 28-31, 33 and 34 have been rejected under §102 as anticipated by Qian et al 2002/0003440 A1 (Qian). This rejection is respectfully traversed.

According to the rejection, Qian discloses a device for handling an optical pulse signal. Respectfully, applicants do not agree.

First, in this regard, Qian discloses a device for generating optical pulses, which relates to a technology completely differing from that of the present invention. Qian clearly describe a cavity laser, which includes a second harmonic generation (SHG) crystal to produce a negative nonlinear phase shift. The purpose of using this element in Qian's scheme is strong compression of laser pulses to the temporal width (~ 10^{-14}s). To compensate the strong phase distortion of the compressed pulse emerging from the SHG crystal, Qian's device makes use of the linear group-velocity dispersion in other parts of the cavity.

All parameters of Qian's device, including the light path set between elements of the cavity, are selected for producing the desired laser effect and the ultra-short pulses.

The present invention, on the other hand, relates to the field of optical communications, and not to the issue of ultra-short pulse generation. The purpose of any communication system is transmitting information over long

distance by means of much wider pulses, with the width on the scale of 100 to 10 ps (~ 10^{-10} to 10^{-11}s). i.e., three or four orders of magnitude larger than those dealt with in Qian's invention.

Stable laser sources that generate pulses with a high repetition rate for the telecommunication networks are easily available; therefore, the principal issue is not the generation of the pulses, but reshaping them and supporting their stability in the course of the transmission. To provide a new and better way of the reshaping, the method and the apparatus/system of the present invention use an SHG element. Such element, with a properly selected internal light path, enables implementation of the following operations in a communication line: treatment of non-linearity accumulated due to the Kerr effect in the system's fiber (such as compensation of the non-linearity, or providing for a necessary residual nonlinearity that helps to maintain the pulses in equilibrium with the fiber's linear group-velocity dispersion), and/or periodic regeneration of the necessary shape of the pulses. Additionally, the use of the second-harmonic field, which is a "by-product" of the proposed scheme, makes it possible to implement continuous monitoring of the pulse stream.

Qian superficially may initially look similar to the present invention just because both utilize an SHG element

(which is also used inside many optical elements in the modern-day photonics). However, the technologies that the rejection compares - a laser and a communication system - are totally different.

Indeed, in the cited laser design proposed by Qian, the chromatic dispersion of the linear part of the cavity compensates phase distortions introduced by the SHG crystal. The fiber's nonlinearity plays no role, whatsoever, in Qian's system. Contrary to that, the present invention proposes compensating the non-linearity accumulated as a result of long propagation in the fiber links by utilizing an adjustable SHG device. Due to the nonlinear nature of the SHG module, and due to the complete difference between the dispersive and nonlinear effects accumulating in optical fibers, the respective compensation schemes proposed by Qian and in the present invention are entirely different. Accordingly, principles on which the selection of the technical parameters is based, and the corresponding mathematical algorithms employed, are also different in the two schemes. The central role in Qian's design belongs to a large nearly linear chirp generated by the SHG element across the pulse; to this end, the SHG module must operate with a large phase mismatch.

In the present invention, to the contrary, the basic physical objective is minimization of the chirp, and small

values of the phase-mismatch coefficient are necessarily employed (see claim 31 in the present patent application).

As can be seen, the technological fields of the two compared documents are different, the physical nature of the compared operations is different, and the proposed schemes are drastically different too.

In order to bring out more clearly some of the aforementioned important differences over Qian, in particular in this regard, claims 1, 13 and 29 have been amended by introducing the words "in a communication fiber link" to better define the environment of the present invention. Applicants respectfully note *Ex parte Kidney*, 158 USPQ 675 (POBA 1967), where the Board stated in part as follows:

> Environmental as well as functional statements may often vitalize a structure being defined. … .
>
> … . No limitations of a claim which would serve to identify the invention should be ignored.

The rejection was reversed.

Of course, applicant's claims define over Qian in additional respects as well, Thus, the rejection stresses that Qian mentions selecting an optical path for an incoming optical pulse. To this, it is necessary to say that, firstly, that Qian does not deal with any incoming optical pulse because Qian's scheme generates optical pulses, rather than

reshaping incoming ones. Secondly, no criteria / conditions are formulated by Qian for selecting the path, neither for obtaining any desired parameters of any outgoing pulse, nor for the purpose of generating ultra-short pulses (which is totally different from the purpose of the present invention). It should be noted that Qian reaches the maximum peak power by dint of amplitude modulation, but not by selecting a suitable optical path (see paragraph 3 of the Office Action, and Fig. 1 of Qian).

Qian does not consider any selectively adjustable optical path within its scheme either.

There are still other important differences: the optical path in the Qian's laser scheme (even in the zig-zag setting, Fig. 3) is chosen between separate elements of the cavity (a number of mirrors and the SHG crystal, etc.). Contrary to that, the present invention selects an optical path for an incoming pulse entirely inside of the SHG element.

It should also be noted that the possibility of monitoring using the second-harmonic field is not even mentioned by Qian.

To bring out some these distinctions more clearly, claims 1, 13 and 29 have been further amended to define the signal handling device as comprising one or more SHG elements,

and to emphasize selecting the inner optical path (inside of them).

Applicants' claims define novel subject matter over Qian. Accordingly, applicants respectfully request withdrawal of the rejection.

No rejections have been imposed under §103. Applicants are proceeding in reliance thereof, and applicants agree that neither Qian nor any other known prior art makes any of applicant's claims obvious.

Favorable consideration and early formal allowance are respectfully urged.

Respectfully submitted,

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